



UNIVERSITÄT ULM
Submission: Friday, 12.05.2017

Prof. Dr. Wolfgang Arendt Henrik Kreidler Sommersemester 2017 Points total: 8
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Evolutionsgleichungen: Exercise Sheet 3

Submission in pairs is possible. If you have any questions or need a hint, send a mail to henrik.kreidler@uni-ulm.de.

This exercise sheet is shorter and therefore only 8 points can be gained.

1. Let A be an operator on a Banach space X and B a *restriction* of A (in symbols: $B \subseteq A$), i.e., $D(B) \subseteq D(A)$ and $Bx = Ax$ for all $x \in D(B)$. Show:
 - (i) If B is surjective and A is injective, then $A = B$. (2)
 - (ii) If $\varrho(A) \cap \varrho(B) \neq \emptyset$, then $A = B$. (2)

2. Show that the following operators $(A, D(A))$ are **not** generators of C_0 -semigroups on $C([0, 1])$.
 - (i) $Af := f'$ for $f \in D(A) := \{f \in C^1([0, 1]) \mid f(0) = 0\}$
(Hint: Show that A is not densely defined.) (2)
 - (ii) $Af := f''$ for $f \in D(A) := \{f \in C^2([0, 1]) \mid f''(0) = 0\}$
(Hint: Show that $\varrho(A) = \emptyset$.) (2)